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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking on the
Commission's Own Motion into Addressing
the Commission's Water Action Plan
Objective of Setting Rates that Balance
Investment, Conservation, and Affordability
for Class A and Class B Water Utilities.

Rulemaking 11-11-008
(Filed November 10, 2011)

**ADMINISTRATIVE LAW JUDGES' RULING SETTING WORKSHOP AND
FURTHER SCHEDULE IN R.11-11-008**

This Ruling sets the dates for a workshop in Rulemaking (R.) 11-11-008. A quorum of Commissioners may attend the workshop. The workshop will be:

9:00 am to 4:00 pm
October 13, 14, and 15, 2015
Golden Gate Room
505 Van Ness Avenue
San Francisco, CA

This Ruling is also served on the service lists of two other proceedings, given the potential for common interests and overlap of issues. The proceedings are not consolidated. Participants in R.13-12-011 and Application (A.) 15-07-019 are invited to participate in the workshop and further proceedings in R.11-11-008, but must move to become a party to formally participate in R.11-11-008 beyond the workshop. This Ruling also adopts a further schedule in R.11-11-008. The schedule beyond the workshop applies only to R.11-11-008.

Parties and participants attending the workshop: (a) are invited to nominate speakers for the workshop, and must do so within seven days of the date of this Ruling; (b) are invited to propose agenda items for the workshop, and must do so within 18 days of the date of this Ruling; and (c) may serve their own partial or full proposal for comprehensive realignment of water utility ratemaking, and must do so within 18 days of the date of this Ruling.

1. Background

On October 22, 2014, the Commission issued its Decision Providing Further Guidance Following Release of Staff Report. (Decision (D.) 14-10-047 in R.11-11-008.) The decision closed Phase I in R.11-11-008, and opened Phase II. (D.14-07-047, Ordering Paragraph 5.) Regarding Phase II, the Commission said:

This proceeding also raised several issues regarding affordability and rates that were not contemplated in the original scope but which are fundamentally related to balanced rates. It is appropriate for the Commission to address these issues presently, especially in light of Governor Brown's January 2014 drought declaration. The Commission will open a Phase II of this proceeding to analyze and propose actions on issues regarding affordability and rate design, including but not limited to conservation rate design such as tiered rate structures, and accounting mechanisms such as Water Revenue Adjustment Mechanisms. The Commission will expand the service list through appropriate process to include all relevant respondents. We anticipate that the scoping memo for Phase II will issue shortly. (D.14-10-017 at 11.)

The Assigned Commissioner's Third Amended Scoping Memo and Ruling Establishing Phase II in R.11-11-008 was filed and served on April 30, 2015 (Third Amended Scoping Memo). The Third Amended Scoping Memo described Phase II this way:

This phase of this Order Instituting Rulemaking (OIR) will evaluate the effectiveness of the Commission's water rate, forecast, charge and recovery

mechanisms in achieving the statutory objective of safe, reliable water service at just and reasonable rates, and in promoting water conservation. In particular, Phase II will evaluate current policies and potential improvements in policies related to: (1) rate structures, including conservation rate design, tiered rates, and other rate-design issues including forecast mechanisms especially in light of the recently issued Executive Order; (2) accounting mechanisms such as the Water Revenue Adjustment Mechanisms (WRAMs) and Modified Cost Balancing Account (MCBAs); and (3) in collaboration with the State Water Resources Control Board and the Department of Water Resources the role and use of data [footnote deleted] and technology to assist in smart conservation among different sectors in the State of California. (Third Amended Scoping Memo at 2.)

The Third Amended Scoping Memo identified 16 issues. It also set a schedule for the filing and service of opening and reply comments.

On May 22, 2015, the Commission issued its Order Adding Nine Respondents to Phase II and Changing Caption. (D.15-05-046 in R.11-11-008.)

On June 11, 2015, timely opening comments were filed by four parties.¹ On June 30, 2015, timely reply comments were filed by two parties.²

2. Discussion

The opening and reply comments address each of the 16 issues. The comments generally align into five topics: (1) rate design, (2) forecasting, (3) technology, (4) WRAM and MCBA, and (5) other. The comments show a difference in recommended approaches across many of the 16 issues, with parties

¹ The four parties are: California-American Water Company (California American Water), California Water Association (CWA), California Water Service Company (Cal Water), and the Office of Ratepayer Advocates (ORA).

² The two parties are: CWA and ORA.

generally recommending incremental changes within existing or previously used rate mechanisms.

2.1. Comprehensive Realignment

The Commission would like to explore a more comprehensive realignment of water utility ratemaking. Now is the time to do this given the goals in the Commission's Water Action Plan; the Phase I results in R.11-11-008; the problems presented by the drought; and the need to consider the best balance of investment, conservation and affordability for Class A and B water utilities.

It is important for parties to think creatively. As said in the Assigned Commissioner's Third Amended Scoping Memo and Ruling Establishing Phase II:

Phase II will review whether it is prudent or reasonable to create standardized or revised tiered rates, better accounting methods, and consider new types of solutions. ... We encourage bold, creative ideas, including radical departures from our current way of doing business. (*Id.*, at 9 and 12.)

2.2. Goals and Proposal

Possible goals for a comprehensive ratemaking realignment are presented in Attachment A. A proposal to potentially achieve these goals is presented in Attachment B. A Commission Policy and Planning Division (PPD) paper titled "Evaluating Forecast Models: Water Revenue Adjustment Mechanism" is contained in Attachment C. These three attachments are presented for the purpose of initiating discussion at a forthcoming workshop on a comprehensive ratemaking realignment for regulated water utilities.

2.3. Workshop

The workshop purpose is to discuss the attached goals, proposal, and paper, and other ideas about water rate design. We encourage parties to use the

workshop to explore bold, creative ideas including radical departures from our current way of doing business. We want parties to discuss what should be the goals for a comprehensive redesign of water utility ratemaking, examine the strengths and weakness of the attached proposal, assess the merits of the PPD proposal, and consider all reasonable improvements and alternatives. Parties should determine if a consensus can be reached on the goals, either of the attached proposals, or an alternative. Even if no consensus is reached, we want parties to use the workshop to advance and examine creative alternatives.

With that objective in mind, parties should not become locked into positions on issues going into the workshop, and need not protect positions during the workshop. Rather – again – the workshop is to be used to consider bold, creative ideas and radical departures from the Commission’s current way of doing business.

A more specific agenda will be served before the workshop. Parties and persons receiving this Ruling may propose speakers that parties request make a presentation at the workshop. They may also propose agenda items, or make their own partial or full proposal for comprehensive realignment of water utility ratemaking.

Nominations of speakers should be made within seven days of the date of this Ruling (to allow time to make arrangements with potential speakers), with service of the nomination on Judge Weatherford and Jamie Ormond. Such nominations should not be filed, and additional service is optional. Proposals for agenda items should be made within 18 days of the date of this Ruling, with service on Judge Weatherford and Jamie Ormond. Again, these proposals should not be filed, and additional service is optional. Partial or full proposals for comprehensive realignment should be made within 18 days of the date of this

Ruling, with service on the service lists for the three proceedings in the caption of this Ruling. Realignment proposals should be no more than five pages long, and should not be filed.

A quorum of Commissioners may attend the workshop. No voting will occur on a Commission decision.

2.4. Further Schedule and Hearing in R.11-11-008

The schedule in R.11-11-008 will provide the opportunity after the workshop for parties to formulate specific positions and proposals, and to present the specifics in proposed testimony. Parties are encouraged to prepare joint testimony when positions are similar, particularly if parties are able to reach a consensus on the attached proposal or an alternate. The schedule shown in Attachment D is adopted.

Regarding testimony, respondents shall, and parties may, serve proposed direct testimony to address the issues identified in the Third Amended Scoping Memo, including the results of the workshop. The use of a common outline will facilitate and promote a clearer understanding of the issues and recommendations. In that light, the proposed direct testimony and rebuttal testimony must be organized using the same outline. In particular, respondents and parties shall address the topics in the following categories and order: (1) rate design, (2) forecasting, (3) technology, (4) WRAM and the MCBA, and (5) other. If a new comprehensive approach for water utility ratemaking is proposed, such as the proposal in either Attachment B or C, the testimony in the first four

categories can refer the reader to the fifth category (Other) where the comprehensive proposal can be made.³

Recommendations must be supported with facts, studies, and expert analysis. Parties presenting a new rate design and overall ratemaking approach are expected to include a sample (or actual) bill analysis, and other sample (or actual) numerical analyses to show the effects of the proposal on the utility and its customers. Recommendations without support will be given little or no weight.

Recommendations must also be specific and include adequate detail for reasonable implementation. For example, proposals to eliminate WRAM and MCBA must include necessary transition details, if any, to permit a reasonably smooth change in regulatory approach. If a party recommends retaining demand forecast updates but proposes they be more frequent, the proposal must state the interval for the update, the proceeding or procedure, and any other necessary implementation details for a complete proposal. Proposals to retain a sales reconciliation mechanism (SRM) must state how and when the SRM is to be applied, in what proceeding or procedure, and any other necessary implementation details for a complete proposal. Proposals for an earnings test must include all relevant mechanics to perform such test, along with any other necessary implementation details for a complete proposal. Similarly, all recommendations and proposals must be specific and include necessary detail for implementation.

³ If this outline turns out later to be unworkable, parties may make a motion for a new outline, including the proposed outline they would like to use. Such motion, if any, must be made sufficiently before the date for the service of proposed testimony to allow a ruling, and allow parties to adapt to the new outline (if the motion is granted).

3. Motions to Become Party

While this ruling is served on the service lists of three proceedings, the proceedings are not consolidated. Participants in R.13-12-011 or A.15-07-019 who want to formally participate in R.11-11-008 (i.e., beyond the workshop, such as serving proposed testimony, cross-examining witnesses, filing briefs) must move for party status in R.11-11-008.

IT IS RULED that:

1. The schedule in Attachment D is adopted. The schedule beyond the workshop relates only to Rulemaking (R.) 11-11-008.
2. Absent the grant of a motion for a different outline, proposed direct testimony for R.11-11-008 shall be presented in the order stated in the body of this Ruling, with proposed direct testimony addressing the 16 issues in the Assigned Commissioner's Third Amended Scoping Memo and Ruling Establishing Phase II, including the matters addressed at the workshop.
3. This Ruling shall also be served on the service lists for R.13-12-011 and Application 15-07-019.
4. Participants in R.13-12-011 or Application 15-07-019 who wish to formally participate in R.11-11-008 beyond the workshop must make a motion for party status in R.11-11-008.
5. A quorum of Commissioners may attend the workshop.

Dated September 14, 2015, at San Francisco, California.

/s/ RICHARD SMITH for
Gary Weatherford
Administrative Law Judge

ATTACHMENT A

Goals and Objectives for the Redesign/Realignment of Water Utility Regulation

Appendix A

Goals and Objectives for the Redesign/Realignment of Water Utility Regulation

The following goals and objectives should be considered in a redesign/realignment of water utility regulation:

1. Facilitate safe and reliable water supply and delivery at just and reasonable rates;
2. Promote economically and socially efficient use of water;
3. Simplify rate design;
4. Quantity rates based on marginal cost pricing;
5. Align cost recovery in rates with cost occurrence - rates based on cost-causation principles;
6. Maintain and improve protections for low-income customers;
7. Maintain and improve conservation incentives;
8. Provide a positive reward mechanism for exceptional conservation by residential customers;
9. Provide opportunity for utility recovery of its revenue requirement;
10. Align utility risk and reward;
11. Eliminate the need for a WRAM/MCBA mechanism;
12. Eliminate the need for sales forecasting and sales adjustment mechanisms in setting rates;
13. Optimally balance investment, conservation, and affordability;
14. Optimally amortize current reasonably incurred balances in WRAM/MCBA and drought-related revenue shortfall mechanisms during the transition.

(End of Attachment A)

ATTACHMENT B

Proposed Comprehensive Realignment of Water Utility Ratemaking

Attachment B

Water Utility Regulation Straw Proposal

I. Rate Design

- A. Monthly Service Charge – Recovers 100% of Fixed Costs and Return less low-income and conservation program costs (see below)
- B. Quantity Rate – All Variable Costs (Purchased Water and Purchased Power (less fixed cost component in purchased water and purchased power costs), Pump Tax, Chemicals)
 - i. Variable Costs Subject to Incremental Cost Balancing Account Treatment to Account for Changes is the Prices of the Variable Components in between GRCs
 - ii. Variable Cost Components Are Offsetable Expenses
- C. Tiered Residential Rate Structure
 - i. Tier 1 – Average Variable Costs per Ccf
 - a. Tier 1 Allocation Based on Allotments of 2 ccf per month per capita or 50 gallons per day per capita
 - ii. Tier 2 – 50% of Long-Run Marginal Cost of Water (e.g. desalination or recycled indirect potable reuse)
 - a. Tier 2 Rate Applies to (e.g., next 5 ccf per connection) Consumption over Tier 1 Allotment
 - iii. Tier 3 – 100% of Long-Run Marginal Cost of Water
 - a. Tier 3 Rate Applies to all Consumption in Excess of Tier 2 Amount
 - iv. All Tier 2 and Tier 3 Revenues in Excess of Tier 1 Rates Are Booked to Public Purpose Balancing Account (see below)
- D. Non-Residential Rate Structure
 - i. Quantity Rate Set at Tier 2 Rates for All Consumption
 - a. All Revenues above Tier 1 Residential Rates Booked to Public Purpose Balancing Account
 - ii. Monthly Service Charge Recovers 100% of Fixed Costs and Return

II. Public Purpose Programs

A. Establish a Public Purpose Balancing Account for Each Utility/Utility District

- i. Tracks Residential Tier 2 and 3 Revenues in Excess of Tier 1 Variable Costs and Non-Residential Quantity Rate Revenues in Excess of Tier 1 Variable Costs
- ii. Tracks Low-Income and Conservation Programs Costs Authorized by the Commission and Incurred by the Utility and Legacy WRAM/MCBA and Drought-Related Revenue Shortfall balances (see below)

B. Low-Income Program

- i. Funded from Tier 2 and Tier 3 Residential Revenues in excess of Tier 1 Variable Costs and Non-Residential Quantity Rate Revenues in Excess of Tier 1 Variable Costs
- ii. Low-Income Credits Applied Against Monthly Service Charge
- iii. All Program Costs Authorized in the GRC Including Low-Income Credits Provided Booked to Public Purpose Balancing Account

C. Conservation Program

- i. Funded from Tier 2 and Tier 3 Residential Revenues in excess of Tier 1 Variable Costs and Non-Residential Quantity Rate Revenues in Excess of Tier 1 Variable Costs
- ii. All Commission Authorized Program Cost that Are Spent by the Utility Are Booked to Public Purpose Balancing Account
- iii. Transition Existing Residential and Non-Residential Conservation Program Design, Except for Educational and Low-Income Components, to Ratepayer Reward Program (see below)

D. Quarterly Residential Ratepayer Reward Program

- i. On an Quarterly Basis, All Revenues, if any, Booked to the Public Purpose Balancing Account Greater than Offsetting previous Quarter's Expenses for the Low-income and Conservation Programs and Previous Quarter's Amortization of Legacy WRAM/MCBA and Drought-Related Revenue

Shortfall Balances Will be Returned to those Residential Ratepayers whose Consumption for the Previous Quarter Was within the Tier 1 Allotment.

- ii. Refund Amounts Calculated Based on Available Revenues in Public Purpose Balancing Account Divided by Number of Eligible Customers
- iii. Any Refunds Will be Through a One-Time Bill Credit; Longer if the Refund Amount is Greater Than the Monthly Service Charge

III. WRAM/MCBA And Drought-Related Revenue Shortfall Accounts

A. Eliminated as No Longer Necessary under Revised Rate Design

- i. Existing WRAM/MCBA and drought-related revenue shortfall over- or under-collected balances at the time the WRAM/MCBA ceases will be credited or amortized against funds in the Public Purpose Balancing Account over the time periods authorized in D.12-04-048 subject to availability of funds in the Public Purpose Balancing Account after conservation and low-income program costs are recovered. Requests for amortization of WRAM/MCBA and drought-related revenue short-fall balances will be through Tier 2 advice letters subject to Division of Water and Audit review and approval.
- ii. For Cal Am, amortization of Monterey District WRAM/MCBA balances will be addressed in A.15-07-019. Outstanding Advice Letters 1057, 1068, 1075, and 1076 should be consolidated and resolved in A.15-07-019.

IV. Sales Forecasting

- #### **A. No Longer Necessary under Revised Rate Design; Also Eliminates the Need for Any Type of Sales Adjustment Mechanism, e.g., SRM**

V. Return on Equity

- A. Equity Premium on Authorized Return on Equity Reduced to 50 – 100 Basis Points above the Average Embedded Cost of Debt
 - i. New Rate Design Reduces Risk, Improves Cash Flow, and Assures Revenue Requirement Recovery

VI. General Rate Cases

- A. Unchanged from Current Rate Case Plan in D.07-05-062

VII. BENEFITS

- A. Simplifies rate design
- B. Aligns costs with revenue recovery
- C. Maintains conservation objectives through tiered rate design based on long-run marginal cost for Tiers 2 and 3 residential and non-residential quantity rates
- D. Establishes Tier 1 residential rates at short-run variable costs to meet basic human needs set at 50 gallons per day per capita
- E. More equitable rate design by establishing Tier 1 allotments based on number of individuals in the household
- F. Assures revenue requirement recovery for utilities
- G. Aligns utility risk and reward by adjusting downward existing equity premium
- H. Aligns conservation objective with residential ratepayer incentive/reward program
- I. Prospectively eliminates the need for a WRAM/MCBA and drought-related revenue shortfall mechanisms
- J. Eliminates the need for an SRM mechanism
- K. Eliminates the need for sales forecasting

VIII. POTENTIAL CHALLENGES

- A. Greater share of utility revenue requirement collected through monthly service than in current rate design –

- i. Proposed rate design eliminates the inherent cross-subsidy from large users to small users in the current rate design
 - a. partially offset by removing public purpose programs and reducing equity premium from the fixed cost portion recovered in the monthly service charge
 - b. partially offset through flowing refunds to small users (those staying within tier 1 allotments) through the quarterly residential ratepayer reward program

(End of Attachment B)

ATTACHMENT C

POLICY AND PLANNING DIVISION

EVALUATING FORECAST MODELS:
WATER REVENUE ADJUSTMENT MECHANISM



2015

Evaluating Forecast Models

Water Revenue Adjust Mechanism

Achieving an efficient urban water economy requires that the nexus between water rates, water consumption, and water revenues are well balanced.

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California Public Utilities Commission
8/17/2015





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Disclaimer

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Foreword

Electric energy consumption per capita has remained nearly flat for several decades in California. This achievement is due, in part to our state's foresight in adopting a rate mechanism that decouples electric revenues from electric sales. On July 3, 2015, the California Public Utilities Commission (CPUC) upped the ante and opened a new chapter in electricity rate design when it adopted a rule to transition to time-of-use (TOU) rates¹. Empowered by access to more timely and accurate information (e.g. AMI data), electricity customers increasingly have the tools to better manage their energy consumption.

The CPUC has based this transition plan not only on a thorough review of empirical data, but also on a set of core rate design principles. In the recent Residential Rate Reform decision, D15-07-001, these principles were stated as follow:

1. Low-income and medical baseline customers should have access to enough electricity to ensure basic needs (such as health and comfort) are met at an affordable cost;
2. Rates should be based on marginal cost;
3. Rates should be based on cost-causation principles;
4. Rates should encourage conservation and energy efficiency;
5. Rates should encourage reduction of both coincident and non-coincident peak demand;
6. Rates should be stable and understandable and provide customer choice;
7. Rates should generally avoid cross-subsidies, unless the cross-subsidies appropriately support explicit state policy goals;
8. Incentives should be explicit and transparent;
9. Rates should encourage economically efficient decision-making;
10. Transitions to new rate structures should emphasize customer education and outreach that enhances customer understanding and acceptance of new rates, and minimizes and appropriately considers the bill impacts associated with such transitions.

These rate design principles along with decoupling electricity sales from utility revenues have formed the pillars of California's energy conservation and greenhouse gas reductions strategies.

Water utilities have also adopted these rate design and decoupling principles, but have met only partial success. While the conservation rate designs appear to be having a positive effect on water consumption, the decoupling mechanism, the Water Revenue Adjustment Mechanism (WRAM), has left consumers confused and frustrated - as the cost for water consumed in one year is collected in following years. These rate lags introduce a distortion to the water market since consumers could see non-drought year rates in drought years and vice versa. Water utilities also face challenges as they must re-adjust to drought year cost swings but only collect non drought revenues.²

Getting the right price signal to water customers is a goal consistent with several of the CPUC rate design principles. Unlike the electric sector, however, the CPUC has not moved as proactively to assure that accurate and timely price signals are sent to water customers. To the contrary, the CPUC has adopted decisions that in some cases delay timely price updates. In particular, decision 12-04-048 ruled

¹ See Decision 15-07-001

² In the electric sector, these demand swings are more gentle over a quarterly time scale and are also mitigated with financial risk management through instruments like energy futures contracts.



that costs incurred in one year should be spread out over several years. While this type of price smoothing may reduce rate shock it does not reduce the overall cost and also sends confusing price signals to customers.

This paper argues that water rates should be updated more regularly. We do not suggest re-litigating rates more often; rather we propose that a **water demand attrition mechanism** is developed during the General Rate Case proceeding (GRC). This attrition mechanism, similar to the interest rate attrition mechanism, would adjust the demand forecasts automatically based on a predefined algorithm.³ The algorithm would be driven by actual conditions and give incremental updates to rates so that they more closely reflect the real costs and economic conditions that consumers and utilities face.

Introduction

In California, water demand forecast models are used to derive water rates for Investor Owned water Utilities (IOUs). Given some forecasted water demand, water rates are then designed that provide sufficient revenue to recover the cost to service that demand. But rates serve other purposes as well, they are also signals that tell consumers what to do and how much to consume. Achieving an efficient urban water economy requires that the nexus between water rates, water consumption, and water revenues are well balanced.

In this paper we look at how deterministic water demand forecast models, can lead to systematically biased predictions and how these biased predictions can lead to problems in the California urban water economy. Especially in an increasingly uncertain and dynamic water economy, we suggest that the biases are not simply a consequence of inaccurate predictive models. Rather we assert that that the output of these models - simple point estimates of expected demand and costs - is not an adequate representation of the uncertain and dynamic revenue prospects that utilities face. As a consequence, revenues, the quantity of water consumed, and water rates can become misaligned.

Currently, the CPUC authorized investor owned water utilities to use a Water Revenue Adjustment Mechanism (WRAM) as a means to account for the difference between revenue forecasts and actual revenue collected. If forecast revenues exactly matched actual revenue than WRAM balances would be exactly zero. When demand is lower than expected, however, revenues drop off and utilities collect less than expected: an under-collection of revenue. Conversely, when demand is greater than expected, utilities will exceed the revenue requirement and over collect revenue. These over and under collections are tracked by the WRAM accounts on a yearly basis. One would expect - if the forecast models were both accurate and stable - that these balances would cancel each other out over time. Over the 7 years of the WRAM program, however, utilities have consistently experienced under collection. This experience has brought attention to the quality and accuracy of the demand forecast models that underpin the revenue requirement.

³ As an example, an algorithm for interest rates adjustments might pin adjustments to the Cal CPI.



In this paper we propose a simple tweak to the WRAM that would compensate for inaccuracies in demand forecast models.⁴ A **water demand attrition mechanism (WDAM)** would define a process for updating water demand forecasts automatically. The WDAM would also require that an updated revenue requirement be recalculated and that rates be adjusted accordingly. These updates would occur inside the 3 year GRC cycle and could be adopted as part of the GRC for each utility.⁵

In section II we review the CPUC experience with the WRAM and Modified Cost Balancing Account (MCBA) and the commensurate water reductions and increases in rate base.

In section III we use the Cobweb model to illustrate the potential problem that lagged prices can have on finding efficient water prices and estimated levels of consumption. We extend that model to include uncertainty about the demand and supply elasticity as well as potential shifts in both supply and demand curves.

In section IV we discuss a method to assess the impact that uncertainties have on revenues in the water sector. Some uncertainties that might be assessed could be the impact of drought, economic downturns, the loss of a major water source, or the addition of a new source⁶. By evaluating the impact of uncertain events, regulators and IOU's can be better informed about the potential risks, costs and revenue impacts that a water utility might face. This preemptive assessment of uncertainties could lead to a new method to value risky investments such as recycling programs, speeding up the investment in smart water meters, communications backbone and water analytics, etc.?

Finally in section V we review a number of possible alternative rate design options. These options include methods to measure and reduce some of the uncertainties in the water market, e.g. water demand.

Section II: Impact of WRAM on Water Consumption and Revenues: 2009 – 2014

Promoting water conservation is a stated policy goal of the CPUC. The CPUC 2005 Water Action Plan (WAP) specifies that the objective is “to strengthen water conservation programs to a level comparable to those of energy utilities”⁷. In order to achieve this goal, the CPUC has adopted a decoupled revenue recovery mechanism. Decoupling water utility revenue from the quantity of water consumed removes the need for utilities to generate company revenue growth through water sales growth – or conversely the incentive for water utilities to discourage conservation – by allowing utilities to receive a rate of return on an agreed upon revenue requirement⁸. This Revenue Requirement is an estimate of the

⁴ These inaccuracies could be due to systematic model bias, data gaps, and external uncertainties such as droughts and economic recessions that are not captured by the forecast models.

⁵ These forecast updates and the associated revenue requirement updates could be made quarterly, semi-annually or yearly.

⁶ For example if the drought continues some water utilities may receive a lower water allocation from water wholesalers. In Monterey the addition of a desal plant as a potential new water source is an uncertainty.

⁷ The Water Action Plan ftp://ftp.cpuc.ca.gov/PUC/hottopics/3water/water_action_plan_final_12_27_05.pdf

⁸ See Decision 08-08-030 for detailed description of decoupling mechanisms.



expected cost to deliver a certain quantity of water. One of the key (though often unstated) assumptions of decoupling is that a model exists that can forecast water consumption levels accurately and with sufficient precision in order to assure that the water utility will be correctly compensated for the water provided to its customers and as a result the water utility will be able to balance its books.

Forecast model and the test year

In most regulatory environments prices are established by taking a test. The “test year” is the model of expected costs that a utility will incur over a year of operation. Traditionally, the “historic” test year model starts out by estimating future sales – i.e. the expected demand for utility service. Here, a water utility test year model estimates future water sales by looking at the demand for water in the utility service area. From these forecasted sales, the costs required to deliver that level of water service are estimated and consequently the revenue requirement (RR) to support those costs is established.

Currently, the preferred CPUC methodology to estimate future sales is called the “**new committee method.**” This method is essentially a regression model that takes into account several factors that contribute to a water utility’s bottom line such as population, household size, climate, and other factors that drive water demand. Typically the model includes the following requirements⁹

- Use monthly sales data for 10 years
- Use 30 year average for forecasted values of temperature and rain
- Remove periods from historical data in which sales restrictions (e.g. rationing) were imposed.

These requirements are somewhat flexible but are designed to reflect the typical or average conditions that a water utility should expect to confront in the coming three year accounting/ GRC cycle¹⁰.

Given the forecasted water demand, the expected cost to provide that service can be determined. The costs are estimated using two methods, the historic test year and the future test year. Historic test year estimate assume that historical costs are a good predictor of future costs. For example a system of a certain size has a historic record of the fixed costs that are required to maintain and operate the system. In addition to the fixed cost the utility will also incur variable costs which are driven by the amount of water demanded. This includes electricity used to pump water and chemicals used to treat water.

The CPUC also incorporates a “future” test year model which includes costs for which there may not be a good historical record. These costs could include new water source acquisition, system retirement costs, pilot programs, new technology investment, expansion projects or other system upgrades. The future test year provides some level of certainty to a utility, since they know which project costs can be recovered before they commit to building/completing to those projects.

In addition to the test year cost estimates, the GRC also includes an attrition mechanism that automatically increases cost estimates in each year of the GRC. The attrition mechanism is design to account for known or expected changes in cost. This includes inflation, contracted salary increases, new

⁹ See Amended Report on the Results of Operations of Great Oaks Water Company for a list of requirements page 2-1 A.12-07-005

¹⁰ This three year GRC cycle only pertains to Class A and B water utilities.



debt service or other expected changes to the utility cost structure. Water service rates are automatically increased each year of the GRC based on an agreed attrition algorithm.

Assessing Forecast Model Performance: The WRAM as a Performance Metric

The CPUC uses two mechanisms to track the accuracy of the water utility demand and expenses forecast models - the Water Revenue Adjustment Mechanism (WRAM) which tracks the variations in the demand for water (i.e. sales revenue) and the Modified Cost Balancing Account (MCBA) which tracks variations in system costs for providing water.¹¹ The difference between the WRAM and the MCBA accounts, defines the amount of revenue that is either under or over-collected by the water utility in a given year.¹² If there is an under-collection then ratepayers receive a surcharge on their bill spread out over a number of years. Conversely, if there is an over-collection, than ratepayers receive a credit on their bill in the following year.

The recovery of surcharges is divided up over multiple bills and recouped over the course of a few years in order to prevent a single lump sum from showing up on water ratepayer bill. This spreading out of the WRAM balance is designed to prevent water ratepayer rate shock.

There are five water utilities that utilize the WRAM and MCBA accounting mechanism and they are Apple Valley, California American, California Water, Golden State Water, and Park Water Company.

The WRAM decoupling mechanism allows a utility to recover its full revenue requirement regardless of the actual water demand. This leaves them financially whole in years when there is an under-collection. It also protects ratepayers in years when there is an over-collection and assures that rates are not unduly excessive and remain affordable. Overall the WRAM removes the incentive of the utility to promote greater water consumption as a means to generate revenue.

While the WRAM does specify the process for recovering the full revenue requirement, ratepayers can still experience rate shock under a number of scenarios. Ideally an under- collection in one year would be followed by an over collection in the following year. This would help to smooth out the rate changes that ratepayers would experience. But if under collection occurs in multiple years in a row, (as can occur in a recession followed by a drought) then WRAM balances would continue to grow. This could leave ratepayers with a burden of not only paying for this years' water bill but also for paying the surcharges for each of last few years. This appears to behave happened to at least one water utility.

Water consumption since 2009 in decoupled utilities

In 2007 through 2009 the US in general and California in particular experienced a recession. Water utilities experienced the revenue pinch as consumers reduced their water use which resulted in reduction of water sales revenue for the utility. At least that is what many people have thought. Figure 1 shows the water consumption for each of the five WRAM utilities normalized to their 2008

¹¹ The primary use WRAM and MCBA are financial accounting mechanisms, but in this context we use them as metrics of the decoupling modeling process. The history of the accounts is simply an indicator of the accuracy of the forecast models

¹² For simplicity we typically use the term WRAM to indicate total under or over collection, i.e. the difference between the WRAM and the MCBA.



consumption levels on a per capita basis. The data is compiled from the annual reports of each of the five utilities. Water consumption values are the actual water delivered as reported in the annual reports normalized to 2008 levels. That data shows that during the recession, consumption drops from 2008 through 2010, ranging from a 5% to 35% drop. This drop resulted in a significant under-collection of revenues for the WRAM water utilities.

Several people have suggested that as the economy recovers water demand will also rebound. This would be beneficial from a WRAM balance point of view since WRAM balances would return to zero and further surcharges would not be needed. This demand recovery, however does not appear to be happening. Rather it seems as if water demand has had a permanent shift and to a lower level. This could be a result of consumer response to the drought or other technology and behavior changes. In any case, the empirical data indicate that some change in ratepayer water consumption quantities, unanticipated by the original forecast model, has occurred and persists.

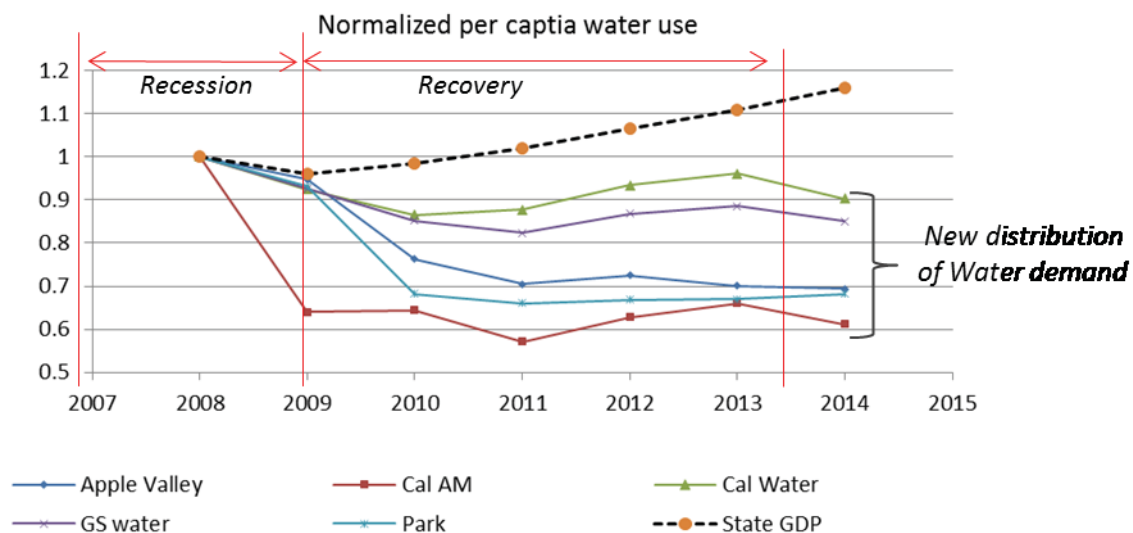


Figure 1 Water consumption and state GDP

This demand shift was apparently triggered by some event (e.g. recession or drought or both) not originally anticipated by original New Committee Method (NCM) forecast model. Because the NCM specifically excludes extreme weather events the model is not even capable of assessing these types of demand shifts. While it is understood that uncertain events, like drought and recessions, do occur the CPUC does not have a robust process to assess likelihood or the expected costs of these types of events. Without this assessment, triggering events can result in significant rate shocks and water rates that are misaligned with water use.

It should be noted that the NCM sales forecast relies on a 10 year average of sales. For an assessment in 2012, this would include the years 2002 through 2011 and would only include 3 years of shifted demand noted in the table above. So if there has been a permanently shift or hardening of water demand than the current sales forecasting model method would be significantly weighted to showcase higher than expected demand.



Revenue in decoupled water utilities

Since the WRAM accounting mechanism was introduced, water utility revenues have consistently fallen short of the expected (anticipated) returns. Figure 2 shows the WRAM/MCBA balance, the difference between the forecast water utility revenue and the actual revenue. A number of factors could be driving this result – the economy, drought. One consistent trend is that result that all WRAM/MCBA balances are short as opposed to in surplus. This means that water utilities will all need to collect extra revenues from their ratepayers after the billing cycle in order to sufficiently prop up water utility revenues to balance their books.

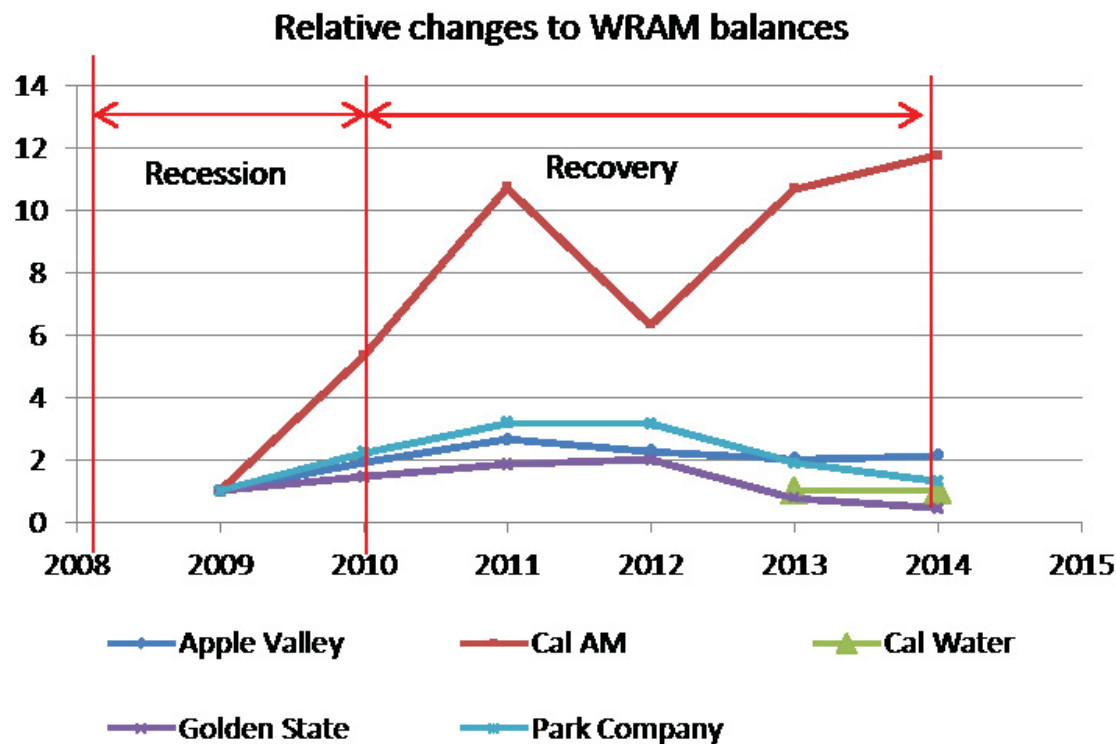


Figure 2 WRAM balances since 2009

Four of the five utilities have WRAM/MCBA balances that spiked when the program was introduced and now seem to be declining. Whether this WRAM account balance spike is the result of the economy or the drought or other factors is unclear. Though it seems that there is a one to two year lag between the economic recovery and the declining WRAM/MCBA balances.

For one utility, however, the magnitude of the WRAM account balance has been steadily increasing even as the recession has waned. We will discuss some factors that may have influenced this in the section on the cobweb model.



Section III: The Water Web

Deterministic models do not anticipate that there is a range of events that can happen over the lifetime of the forecast. When historic trends are stable this may be a fine assumption. But in less “well behaved” environments, the models can break down, since the assumed average costs may not reflect the shifted cost profile that the utilities or consumers experience in a transformed environment.

COBWEB Model: Cautionary tale for decoupled water One way to understand how deterministic models can go wrong can be shown using the cobweb model as an illustration of inter-temporal instability. The cobweb is a model for a competitive market where prices are set by the market. In this case prices fluctuate from one period to the next (year to year), but water production decisions are set in the current year using the current year prices. In the regulated environment, this type of situation can be thought of as the price lag that WRAM balances in the current year places on future year rates.

Consider a revenue forecast that estimates a certain level of water demand $q(1)$ and a commensurate level of water production. Now if there is a drought, a call for water conservation may reduce the total water demand and actual revenue will be less than the forecast revenue. This water demand shortfall effectively raises the cost per unit water produced, i.e. the rate. This effective rate because in decouple water utilities the revenue requirement must be met regardless of the water delivered. When water demand goes down, the rate must go up. These prices however are not experienced by the consumer in the year of the drought; rather costs are passed on in the following year, $p(2)$. In the following year the utility must decide how much water to procure based on the previous years’ consumption and the current year price - including the last year drought surcharge. Consumers will respond to those new distorted prices and land at some new level of consumption according to their demand function. Producers once again update their production schedule based on the 3rd incarnation of distorted a price signal and around the cycle goes.

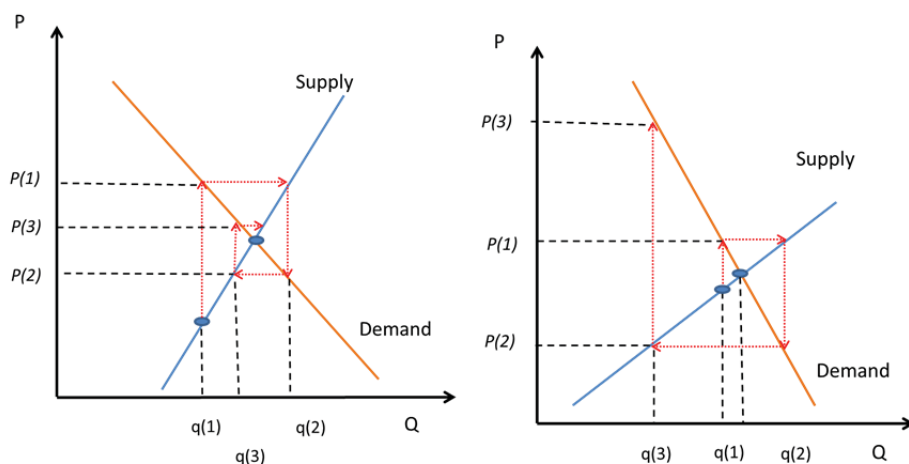


Figure 3 Cobweb model

This cobweb process has two possible outcomes. In the first case prices converge to an equilibrium price. In this case the “difference” between the prices in each year is decreasing and so over time the price would “cobweb” inward and will reach the market equilibrium. One might expect that this type of



perturbation occurs as the result of a WRAM balance in one cycle leading to a price change in the next cycle. Ideally these WRAM balances are zeroed-out over time and have a decreasing impact on the price of water.

In the second case, however, the prices diverge. In the divergent case, the price “differences” in each period are increasing and prices “cobweb” outward. This would certainly be a market failure as producers would be producing goods far in excess (or short) of what the market could efficiently consume.

The condition that determines if prices are diverging or converging is the ratio of the slope (ϵ) of the demand curve to slope of the supply curve. The convergent case occurs when the magnitude of the slope of the demand curve is less than magnitude of the slope of the supply curve and diverges when the slope of the demand is greater than the supply curve slope.

Converging	Diverging
$ \epsilon_{demand} < \epsilon_{supply}$	$ \epsilon_{demand} > \epsilon_{supply}$

While the cobweb model was originally constructed to model a competitive economy - where prices where set by the market - there are, however, parallels for decoupled regulated market.

For water utilities to achieve cost effective service it requires that this dynamic is well controlled and behaved. Knowing if utility prices and demand are diverging or converging certainly is a critical stability issue. In the case of Cal AM it appears that the WRAM balances have gone to an unsustainable level. In particular as consumers are being asked to rethink how they use water and water utilities are seeking new sources of water, options for new supply and demand are diminishing.

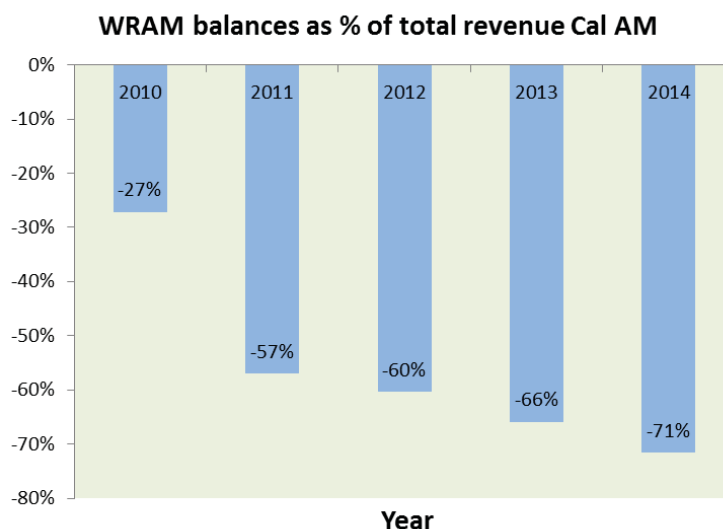




Figure 4 WRAM balances as a percent of revenues.

Demand Shifts from Water Restrictions

The extent that consumers respond to messages to limit demand can be viewed as a shift in demand. This shift depends on a number of factors. The ability to reduce water use depends on where you start out. An apartment dweller has fewer options to reduce water use than someone with ten lychee trees in her backyard. Income distribution also plays a factor as some users are simply willing to pay high prices for water.¹³ These demand shifts do not move in lock step. Different regions and demographics areas will have different responses. In the aggregate, there is some shift that is associated with the new economic climate (Figure 3). This shift may not only move the demand to the left but can also change the elasticity (i.e. the slope of the curve). Updated rate schedules should recognize that this shift can impact the revenue stability of the utilities - i.e. do the new conditions make it more or less likely that an unstable dynamic will occur?

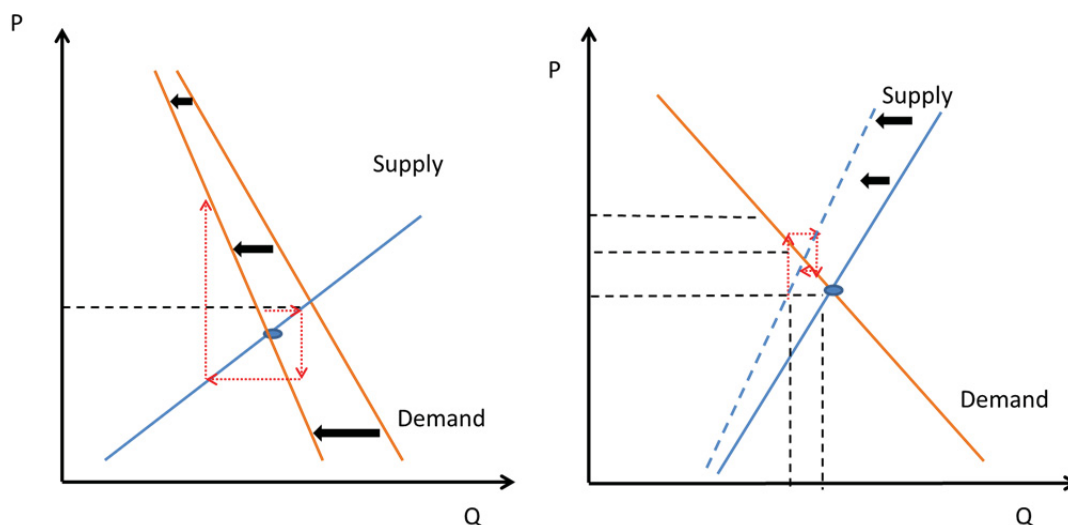


Figure 5 Demand shift and a change in elasticity

Supply Disruptions and Cost Volatility

Supply shifts can also impact the stability. Particularly in the drought like the one we are experiencing, reductions in allocations, increased wholesale prices, and reliance on lower quality water can change the supply portfolio and the overall cost to provide water services. These new costs are beginning to appear in IOU filings as several utilities have had decrease sales volume but also have increased operational costs per unit of water delivered.

The Cobweb in Rate-setting

The cobweb model describes how prices and consumption interact with each other over time. While regulated water prices are determined in the rate setting process, decoupled rates and the resulting WRAM balances can induce price lags into the water market.

¹³ Designing Drought-Resistant Nonlinear Price Schedules for Water Utilities, Wolak, F., 2015, Stanford University Unpublished prerelease paper



The cobweb model defines conditions in which economic equilibrium is stable and unstable. Particularly in the midst of a drought, the ability to avoid undesirable market instabilities is clearly in the rate payer's interest.

Section IV: Cost models for an uncertain water market

Decoupling and the WRAM are typically thought of as programs that enable water conservation. However, the WRAM is also a risk mitigating program. It is essentially a financial “governor” that regulates the cash flow of utilities, retail water rates, and overall water consumption. While the water utilities should enjoy increased revenue stability (in principle lowering their cost of capital), decoupling also imparts a fiduciary responsibility to utilities to not only provide water but also provide it reliably.

The cobweb model, however, implies that revenue stability may come at a cost. WRAM induced lagged price can create instability and if left unchecked could lead to highly inefficient and unsustainable allocations of resources. Particularly in a drought, the addition of uncertainty about the price of water may be less than desirable and counterproductive to achieving a reliable reduction in water use.

The cobweb model also illustrates an important characteristic about the traditional deterministic cost models that lies behind the revenue requirement. In the deterministic modeling, costs are simply modeled as linear functions of some set of factors (i.e. a regression model). These models assume that some uncertainty about the factors exists but the underlying assumption is that the model will be “good enough” and that the uncertainty will be insignificant when making the revenue requirement decision (Figure 1a.)¹⁴.

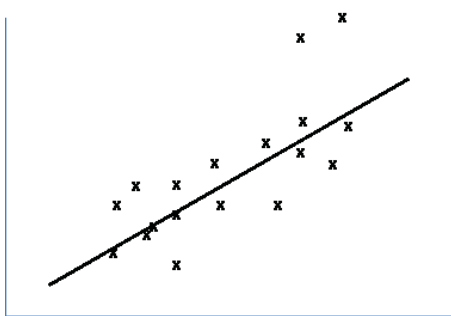


Figure 1A) Deterministic model (new committee method)

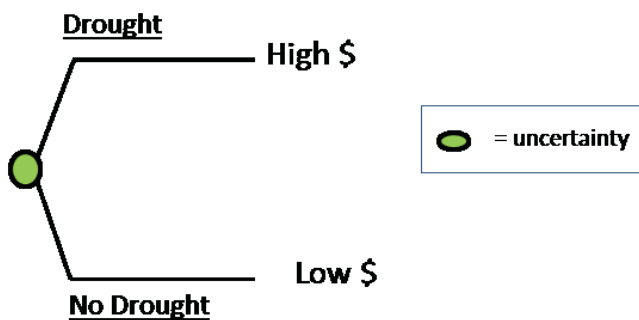


Figure 1B) Alternatives cost model with uncertainty

The cobweb model illustrates how prices can follow two possible paths, diverging or converging. These two outcomes are not incrementally different but depend on an unknown condition, the ratio of elasticities that can flip between states. This is a non-linear function of the demand and supply

¹⁴ Strategy Under Uncertainty, Courtney, H., Kirkland, J., Viguerie, P., Harvard Business Review, Nov- Dec '97 This paper describes linear and alternatives models that organizations use to model and manage decision making under uncertainty.



elasticities (Figure 1b.) If cobweb or other non-linear dynamics drive costs in regulated markets, then deterministic regression models of demand have a fundamental weakness that more precise modeling simply cannot cure.

Scenario Model of Costs

If future costs can take different paths (e.g. drought or no drought), then cost models should be designed to represent how these scenarios unfold. One way to model different types of outcomes is with decision trees. Decision trees help identify and quantify uncertainties and estimate the value of uncertain events in the context of a decision.¹⁵ What could happen to revenues if the drought persists 3 years? What could happen to revenues if “normal” conditions return for 3 years? How will customers respond to multiple tier rate blocks if we have a drought? How would they respond to those blocks if we return to “normal”? The objective in this process is not to decide which uncertainty is most likely. Rather the objective is to develop the “best” decision framework given the range of things that could happen.

For example, suppose the commission is considering two proposed decisions; one with a high revenue requirement (RR) and one with a lower RR. The WRAM balances over the three years of the GRC will depend on the occurrence of a drought. If there is a drought, mandatory water restrictions will be enforced, revenues will drop, and WRAM balances will go up. Successive drought could lead to increasingly large WRAM balances and potentially create price and revenue instability issues.

Figure 2 shows the GRC decision framework with projected WRAM balances for the scenarios of - 0 years to 3 years of drought. If the CPUC selects high RR, the expected range of WRAM balances is -\$15 M to \$20M over the four scenarios. The low RR has a range of \$0 to \$60M.

To assess the expected value of each decision we also need to assess the probability, P^* , that 0, 1, 2 or 3 years of drought are experienced. Assume there is expert testimony that has assessed the probability for drought as shown below.

Years	0	1	2	3
Probability	10%	40%	30%	20%

¹⁵ See *Advances in Decision Analysis: From Foundations to Applications*, Ward, E., Miles, R., Von Winterfeldt, D., Cambridge University Press, 2007.

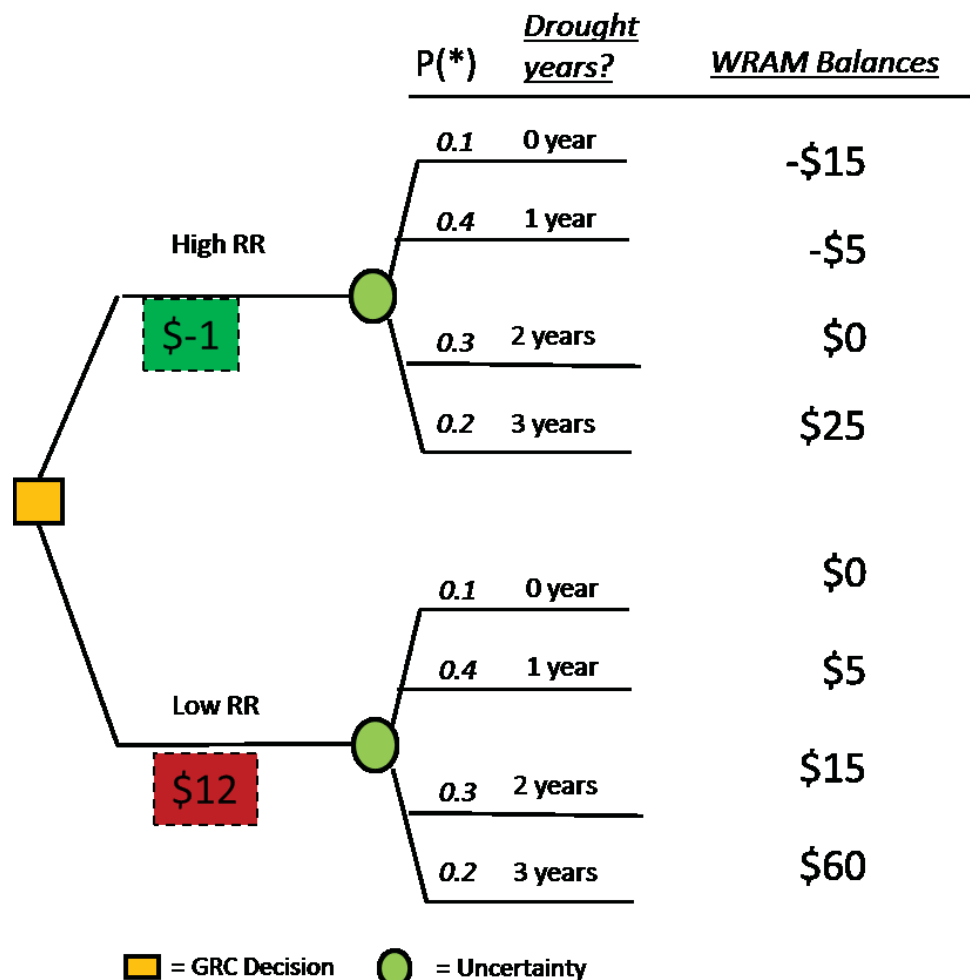


Figure 6 Revenue Requirement Decision Tree with three year expectation

The CPUC is faced now with two uncertain futures (Figure 6) - one has a range of possible outcomes of \$60M with an expected value ¹⁶of \$12M the other a range of \$40M with an expected value of -\$1M.

Of course the uncertainties over this time range are likely to be large and contested. Predicting the weather has never been easy. Even with this assessment there are still other factors (e.g. the economy) that can impact what customers will actually consume and what it costs to provide those services.

Section V: A Proactive Approach to Managing Rate Adjustments

Even the best models will be wrong. But every time we exercise a model we get more information. As some of the uncertainties are resolved (e.g. did it rain last year? yes or no?) we should be able to improve the forecast. Let's assume that the CPUC and the IOUs want to manage these models

¹⁶ The expected value is the product of the probability and the WRAM balance for each outcome summed over all possible outcomes.



proactively and improve the demand forecasts during the course of a GRC cycle. It could introduce a water demand attrition algorithm. The algorithm would specify how the water sales forecast would be updated in each year. Some inputs to the algorithm might include drought conditions, reduction in water demand, and hardening of water demand. With this knowledge, an updated expected water demand could be calculated. This new recalculated water sales forecast would establish an updated revenue requirement. The new rate could then be recalculated using the same algorithm establish in the GRC. This is not the same as WRAM balance adjustment, which simply tracks costs and then recovers them in subsequent years¹⁷. The new method updates the forecast and then re-calculates the rates required to achieve the revenue requirement. See Figure 7 for an illustration of how rates might be updated over the course of a three year GRC. In this example we have chosen a simple algorithm to update the forecast. We take the average of the last forecast and the actual demand of the current year. This averaged value becomes the new forecast. This simple demand attrition algorithm still accounts for the fundamental drivers of demand derived in the original water sales model but adjusts for unknown bias by removing the first year error. In our example the cumulative WRAM balances are reduced by more than half simply by updating the sales forecasts in year 2 and 3.¹⁸

WRAM			Proposed Rate Adjustment		
			Year 1	Year 2	Year 3
Model Forecast	Expected Demand		100	100	100
	Revenue Requirement		\$ 100.00	\$ 105.00	\$ 110.25
	Cumulative Requirement		\$ 100.00	\$ 205.00	\$ 315.25
	Standard Quality Rate		\$ 1.00	\$ 1.05	\$ 1.10
Actual	Actual Demand		94	93	94
	Actual Revenue		\$ 94.00	\$ 100.65	\$ 108.81
	Cumulative Revenue		\$ 94.00	\$ 194.65	\$ 303.46
	Actual SQR		\$ 1.06	\$ 1.13	\$ 1.17
WRAM Balances	Yearly		\$ 6.00	\$ 4.35	\$ 1.44
	Cumulative Difference		\$ 6.00	\$ 10.35	\$ 11.79
			Year 1	Year 2	Year 3
Model Forecast	Expected Demand		100	97	95
	Revenue Requirement		\$ 100.00	\$ 105.00	\$ 110.25
	Cumulative Requirement		\$ 100.00	\$ 205.00	\$ 315.25
	Standard Quality Rate		\$ 1.00	\$ 1.08	\$ 1.16
Actual	Actual Demand		94	93	94
	Actual Revenue		\$ 94.00	\$ 103.67	\$ 112.75
	Cumulative Revenue		\$ 94.00	\$ 197.67	\$ 310.42
	Actual SQR		\$ 1.06	\$ 1.13	\$ 1.17
WRAM Balances	Yearly		\$ 6.00	\$ 1.33	\$ (2.50)
	Cumulative Difference		\$ 6.00	\$ 7.33	\$ 4.83

Figure 7 WRAM balances over 3 year GRC cycle

¹⁷ The WRAM currently recovers costs over multiple years

¹⁸ This can be shown to be a robust updating algorithm with a simple simulation of prices over the distribution of possible scenarios



In this approach prices respond much more quickly to conditions, lags are reduced significantly, and consumers face rates that more closely reflect actual costs.

We envision the demand attrition algorithm should be developed as part of the GRC. During the GRC cycle rate updates would be implemented like the interest rate attrition updates. This does not require re-litigating rates, rather the algorithm runs on auto –pilot and simply updates values based on current information.

While we have illustrated these forecast and rate adjustments on a yearly cycle, we could also consider making these updates in faster – perhaps quarterly. For water, the pace of updates is really quite important , since in January we may be still hoping for rain, but at the end of March we will know if it has rained or not.

Conclusions

Uncertainty in the urban water economy is increasing and this is creating new challenges for assuring that reliable water service is delivered at a fair and reasonable cost. Decoupled water rates and the WRAM have taken the first step to creating incentives to promote water conservation by assuring revenue stability for water IOUs. But in a highly uncertain and changing environment, deterministic models may not adequately represent the revenue risks that utilities are facing. Evidence from the five decoupled water utilities indicates that WRAM balances are consistently biased to under-collection of revenue. This bias could result in confusing and time lagged water rates. If left unchecked, this bias, in principle, could create unstable and economically inefficient conditions for both water utilities and consumers.

We have proposed a new process for estimating and updating demand and aligning those updates with more frequent adjustment of water rates. This process implicitly recognizes that uncertainties exist in modeling and that empirical realizations of water demand should be incorporated more rapidly. Developing good updating criteria will be critical to the successful implementation of these types of updates.

This new approach should lead to more cost effective water service. The value increase comes from the possibility that the CPUC can update rates based on better information. In this case tweaking the water demand forecast midstream might be more valuable than tracking the WRAM balances on a year by year basis and assessing surcharges. **If the Commission wanted to further develop and discuss this idea then we suggest opening a formal Rulemaking to further investigate.**



Acknowledgements

This paper would not be complete without the significant advice and contributions of these individuals:

- ✓ Rami Kahlon, Director, Division of Water & Audits, CPUC
- ✓ Bruce DeBerry, Program Manager, Division of Water & Audits, CPUC
- ✓ Lester Wong, Advisor to Commissioner Liane Randolph, CPUC
- ✓ Stephen St. Marie, Senior Regulatory Analyst, Policy & Planning Division, CPUC

ATTACHMENT D

ADOPTED SCHEDULE FOR R.11-11-008

ATTACHMENT D

ADOPTED SCHEDULE FOR R.11-11-008

LINE NO	ITEM	DATE
1	Nominations for workshop speakers	Within 7 days of date of Ruling [1]
2	Proposals for agenda items	Within 18 days of date of Ruling [2]
3	Partial or full proposals for realignment (limited to no more than 5 pages)	Within 18 days of date of Ruling [3]
4	Workshop	9:00 am to 4:00 pm October 13, 14, and 15, 2015 Golden Gate Room 505 Van Ness Avenue San Francisco, CA
5	Serve Proposed Direct Testimony	November 16, 2015
6	Serve Proposed Rebuttal Testimony	December 2, 2015
7	Hearing	9:30 am December 15-18, 2015 Commission Courtroom 505 Van Ness Avenue San Francisco, CA
8	Opening Briefs	TBD
9	Reply Briefs	TBD
10	Submission	Date reply briefs are filed
11	Proposed Decision	Within 90 days of submission
12	Commission Decision	No sooner than 30 days after Proposed Decision
13	Close Proceeding	No later than October 30, 2016 [4]

[1] Nominations shall be served on Judge Weatherford and Jamie Ormond, and shall not be filed. Additional service is optional.

[2] Proposals for agenda items shall be served on Judge Weatherford and Jamie Ormond, and shall not be filed. Additional service is optional.

[3] Realignment proposals shall be served on the service lists for the three proceedings in the caption of this Ruling, and shall not be filed.

[4] See Third Amended Scoping Memo at page 17.

(End of Attachment D)